

What is claimed is:

1                   1. A method of determining product performance comprising the  
2 steps of:  
3                   collecting product performance data;  
4                   determining the failure mode of detected product failures;  
5                   conducting a failure mode effect and analysis procedure to determine a  
6 degree of risk of a detected failure; and  
7                   developing corrective action to correct the detected failures.

1                   2. The method of claim 1 wherein determining the degree of risk  
2 comprises the steps of:  
3                   determining the severity of the effect of each failure; and  
4                   determining the frequency of occurrence of the effect of each failure.

1                   3. The method of claim 2 further comprising the step of:  
2                   ranking the determined severity of effects of a plurality of different  
3 detected failures to generate a plurality of different severity ranking values; and  
4                   ranking the determined frequency of occurrences of a plurality of  
5 different failures in ranked frequency of occurrence values.

1                   4. The method of claim 3 further comprising the step of:  
2                   determining a preliminary risk assessment of each failure as a product  
3 of the ranked severity value and the selected ranked frequency of occurrence value.

1                   5. The method of claim 4 further comprising the step of:  
2                   comparing the preliminary risk assessment with a threshold to  
3 determine high risk assessments.

1                   6.        The method of claim 5 further comprising the step of:  
2                   determining the root cause of detected product failures for product  
3                   failures having a preliminary risk assessment at least equal to a threshold.

1                   7.        The method of claim 1 further comprising:  
2                   assigning a severity rank value to the each failure effect; and  
3                   assigning a rank value to the determined frequency of occurrence of  
4                   each failure effect.

1                   8.        The method of claim 1 further comprising the step of:  
2                   verifying the corrective action.

1                   9.        The method of claim 8 wherein the step of verifying the  
2                   corrective action comprises the step of:  
3                   ranking a validation of a failure corrective action based on at least one  
4                   of the type of validation test, the sample size and the test time.

1                   10.      The method of claim 9 further comprising the step of:  
2                   determining a final risk assessment for each corrective action equal to  
3                   the product of the determined severity value, the determined frequency of occurrence  
4                   value and the determined failure correction validation value.

1                   11.      The method of claim 10 further comprising the step of:  
2                   comparing the final risk assessment value with a threshold to determine  
3                   failures requiring corrective action.

1                   12.      The method of claim 1 wherein the step of collecting failing  
2                   product performance data comprises the step of:  
3                   forming a plurality of selectable databases containing product  
4                   performance data for at least two of field performance, product change request,  
5                   manufacturing performance, validation performance, prototype and pilot build

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6 inspection, measurement system performance, simulation, supplier development  
7 performance, process control, production process capability performance,  
8 manufacturing preventive maintenance, engineering development test performance,  
9 lessons learned, engineering calculations, dimensional tolerance stack-up analysis,  
10 internal/external part interface analysis, new customer requirement, supplier  
11 requirement, cost improvement, drawing change and tool wear.

1 13. The method of claim 12 further comprising the step of:  
2 forming summary statistics of product performance failures for each  
3 selected product performance data database.

1 14. The method of claim 1 further comprising the step of:  
2 determining the cost of quality assessment.

1 15. The method of claim 14 wherein the step of determining the  
2 cost of quality assessment comprises the step of:  
3 determining the total cost of quality assessment by the sum of  
4 prevention costs, appraisal costs and failure costs.

1 16. A method of determining product performance comprising the  
2 steps of:  
3 collecting product performance data;  
4 determining the failure mode of detected product failures;  
5 determining probability of occurrence of each detected failure;  
6 ranking the probabilities of occurrence of each failure to obtain a  
7 occurrence value;  
8 determining the severity of effects of each failure;  
9 ranking the severity effects of each failure to obtain a ranked severity  
10 effect value; and  
11 determining a preliminary risk assessment of each failure as a product  
12 of the ranked severity value and the ranked frequency of occurrence value.

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1                   17. The method of claim 16 further comprising:  
2                   comparing the preliminary risk assessment with a threshold to  
3 determine high risk assessments.

1                   18. The method of claim 17 further comprising the step of:  
2                   determining the root cause of detected product failures for product  
3 failures having a preliminary risk assessment at least equal to a threshold.

1                   19. The method of claim 18 further comprising the step of:  
2                   developing a corrective action to the determined root cause of the  
3 detected product failure; and  
4                   verifying the corrective action.

1                   20. The method of claim 19 wherein the step of verifying the  
2 corrective action comprises the step of:  
3                   ranking a validation of a failure corrective action based on at least one  
4 of the type of validation test, the sample size and the test time.

1                   21. The method of claim 20 further comprising the step of:  
2                   determining a final risk assessment for each corrective action equal to  
3 the product of the determined severity value, the determined frequency of occurrence  
4 value and the determined failure correction validation value.

1                   22. The method of claim 21 further comprising the step of:  
2                   comparing the final risk assessment value with a threshold to determine  
3 failures requiring corrective action.

1                   23. An apparatus for determining product performance comprising:  
2                   means for collecting product performance data;  
3                   means for determining the failure mode of detected product failures;

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4                   means for determining probability of occurrence of each detected  
5 failure;  
6                   means for ranking the probabilities of occurrence of each failure to  
7 obtain a occurrence value;  
8                   means for determining the severity of effects of each failure;  
9                   means for ranking the severity effects of each failure to obtain a ranked  
10 severity effect value; and  
11                   means for determining a preliminary risk assessment of each failure as  
12 a product of the ranked severity value and the ranked frequency of occurrence value.

1                   24. The apparatus of claim 23 further comprising:  
2                   means for comparing the preliminary risk assessment with a threshold  
3 to determine high risk assessments.

1                   25. The apparatus of claim 24 further comprising the step of:  
2                   means determining the root cause of detected product failures for  
3 product failures having a preliminary risk assessment at least equal to a threshold.

1                   26. The apparatus of claim 25 further comprising the step of:  
2                   means for developing a corrective action to the determined root cause  
3 of the detected product failure; and  
4                   means for verifying the corrective action.

1                   27. The apparatus of claim 26 wherein the step of verifying the  
2 corrective action comprises the step of:  
3                   means for ranking a validation of a failure corrective action based on at  
4 least one of the type of validation test, the sample size and the test time.

1                   28. The apparatus of claim 27 further comprising the step of:

2 means for determining a final risk assessment for each corrective  
3 action equal to the product of the determined severity value, the determined frequency  
4 of occurrence value and the determined failure correction validation value.

1 29. The apparatus of claim 28 further comprising the step of:  
2 comparing the final risk assessment value with a threshold to determine  
3 failures requiring corrective action.

1 30. The method of claim 16 wherein the step of comparing the  
2 preliminary risk assessment with a threshold comprises the steps of:  
3 defining the threshold as a severity value at least equal to one ranked  
4 severity value; and  
5 comparing the final risk assessment value with the threshold to  
6 determine failures requiring corrective action.

1 31. The method of claim 16 wherein the step of comparing the  
2 preliminary risk assessment with a threshold further comprises the step of:  
3 defining the threshold as a customer override input.

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